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The six hundred and thirty-second meeting of the Club was held at the Rembrandt Hotel, London, on the 15th February, 1966.

Chairman: Dr. J. F. Monk

Members present 10; guests 3.

Mr. J. A. Hancock spoke on the birds, both native and introduced, of Kauai, Hawaiian Islands, illustrating his talk with coloured slides.

Some of the introduced plants could become a menace to the Drepanidae by spreading and inhibiting regeneration of the endemic food plants and the *Zosterops*, now well established, could become so numerous as seriously to compete for the available food supply.

Plumage pattern and colour relationships of the genera *Carduelis* and *Fringilla*

by C. J. O. Harrison

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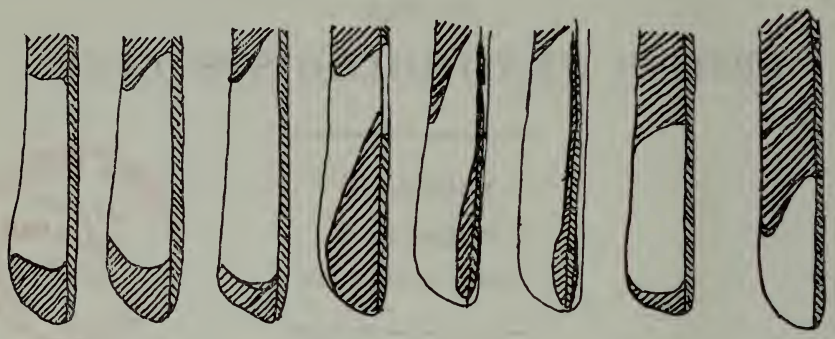
Studies of plumage pattern and colour reveal (Harrison 1963a, 1963b) that, although within any group of related species considerable specific differences of pattern and colour may be evolved, nevertheless this variation appears to be confined within certain limits and the patterns reveal the underlying relationship. In the present study the pattern and colour relationships of *Carduelis* (including *Spinus*, *Chloris*, and *Hypacanthis*, after Vaurie 1959) and *Fringilla* are examined. This provides additional evidence of the taxonomic affinities of *Fringilla*.

Tordoff (1954), in a comparative study of the bony palate in seed-eating birds, concluded on this evidence that *Fringilla* was a part of the bunting family Emberizidae, and of different origin from the cardueline finches. The Emberizidae became the Fringillidae, a name previously used for the

Old World finches which were now placed as a subfamily, Carduelinae, in the weaverbird family Ploceidae. This has unfortunately been used without comment in some popular works, as in Austin's work (1961). Mayr, Andrews, and Hinde (1956) showed that Tordoff's conclusions were



From left to right, outer tail feathers of:—
Carduelis carduelis neidiecki
„ „ *caniceps*
„ „ *caniceps*
Fringilla coelebs tintillon
„ „ *coelebs*
„ „ *coelebs*
Carduelis carduelis neidiecki
Fringilla coelebs tintillon

unsatisfactory on anatomical and ethological grounds. Bock's more comprehensive study (1960) of the palatal processes considered significant by Tordoff showed that these are highly adaptive and are not useful as taxonomic characters; and Zisweiler's study (1965) of the horny palate confirmed the cardueline relationships of *Fringilla*. Plumage pattern and colour offers an additional character for examining this relationship. Only the Palaearctic species of *Carduelis* have been considered.

THE GENUS *Carduelis*

(a) *Siskin plumage pattern*

Female and immature forms of the Siskin *C. spinus* have a mainly heavily streaked plumage which links them with cardueline finches of other genera. Within *Carduelis* it appears to constitute the earliest plumage pattern, and has largely disappeared but persists as a relict pattern in the immature plumages of most species. The male *C. spinus* shows two main trends apparent in colour and pattern evolution in this group—the trend towards extensive yellow pigment, and the development of increased melanism, more particularly as areas of black plumage on the head.

There is streaking on mantle and rump. The back is olive-green, with yellow on the rump; and the underside greenish-yellow, with white on the belly. The top of the head and the chin are black. The ear-coverts are olive green, and there is a yellow supercilium continuing as a narrow yellow zone bordering the ear-coverts and separating crown, coverts and chin. There is an almost complete wing-bar formed by yellow bases on both webs of the inner primaries and all secondaries, reinforced by yellow tips to the greater secondary coverts. The edges of the inner secondaries are

creamy-white, and the outer tail feathers have yellow patches on the inner web towards the base.

(b) *Greenfinch–Goldfinch link*

The Chinese Greenfinch, *C. sinica*, appears to be a central species in that it shows varied basic patterns from which those shown by several other species could have diverged. The female of *C. sinica sinica* is dull brown on the mantle, with a greenish-yellow rump and grey upper tail-coverts; and below the breast is buff-brown with a faint chestnut tint to the flanks, with some individually variable yellow towards mid-breast and mid-belly, and the belly is white. The head is grey, with a touch of green on forehead, supercilium and throat in some individuals. The wing has a broad bar formed by yellow primary and secondary bases, with only a dark line of melanin along the rachis, and the innermost secondaries have broad white edges shading to grey-brown on innermost feathers, while in fresh plumage most flight feathers have greyish-white tips. The outer tail feathers have yellow bases, while the distal half is black.

The eastern race of the Goldfinch *C. carduelis caniceps* resembles to some extent a female of *C. sinica* in which both yellow and brown colour have been reduced. It has a greyish-brown mantle and less grey-brown below, the belly, mid-lower breast, and throat being white, as are rump and upper tail-coverts.

The wing has a similar broad yellow bar on the outer webs of the flight feathers and a concealed white patch on the inner webs; while the white edges of the inner secondaries are restricted to an area at the tip and form a distinct bar on the closed wing. The outer tail feathers have large white patches on the inner webs, and white tips on the central feathers. Most of these differences are only a matter of degree; the one conspicuous difference between this species and females of *C. sinica* being the presence on the grey head of an area of red feathering on forehead, lores and chin.

In the western races of *C. carduelis* the mantle and upper breast are warm brown. Compared with the eastern birds the white on the secondaries and on the outer tail feathers is reduced, and there are small white tips on all flight feathers. The head colouring has evolved still further. In addition to red on forehead, lores and chin, there is black on the crown and also extending down posteriorly on either side of the nape in a narrow crescent, with a zone of white on the side of the head between red and black.

(c) *Greenfinch–Siskin complex*

The female of *C. sinica sinica* is described above. The male has a brown back, yellow rump, and grey upper tail-coverts; while breast and flanks are brown, tinted with chestnut-red, and heavily suffused with yellow. Mid-breast and belly are yellow. It is grey on crown, ear-coverts and nape, and yellowish-green on forehead, supercilium and throat. Wings and tail are like those of the female.

In Japan there are two rather similar races, the smaller darker *C. s. minor* and larger paler *C. s. kawarahiba*. In the former race the female is much browner than that of the nominate race, rump and flanks as well as breast being mainly brown and the head having a brownish wash. The brown of breast and flanks has a distinct chestnut tint, and this is more marked in the similar but paler female of *C. s. kawarahiba*. The male of both Japanese races is darker than the nominate form. The crown and nape of the head are slate grey, forming a well-defined cap extending down onto the neck.

The mantle is olive-brown, the rump greenish-yellow, and the tail-coverts grey. The forehead, supercilium, ear-coverts and throat are yellowish-green, and lores and forehead have a blackish tint. The underside is chestnut-brown heavily suffused with yellow, with some green on the mid-breast. The wings and tail are like those of the nominate race, save that in the latter the carpal joints show only a little yellow feathering, while in the Japanese races there is more extensive yellow on the primary coverts.

The male of another race, *C. s. kittlitzi*, from Bonin Islands shows more extensive yellow pigment and is green over most of body and head, with a brown tint on mantle and flanks and grey on the crown. The amount of yellow on the wing-bar of the primaries is reduced by black pigment along the rachis to a yellow area on the outer web and a reduced pale yellow area towards the edge of the inner web. The edges of the inner secondaries are grey. Apart from the complete wing-bar the Bonin bird would appear to be more similar to *C. chloris* than to *C. sinica*. The female is dull brown, greyer-brown on the head, and similar to the females of Japanese races but duller.

The Common Greenfinch, *Carduelis chloris*, is a paler, greener version of these birds. The male of the eastern form, *C. c. turkestanicus*, is ash-grey on crown and nape, and this also extends on to the posterior part of the ear-coverts, but in the nominate form the crown is green. The eastern birds are mainly green and yellow, but in the western forms the winter plumage has brown tips to the feathers of mantle and flanks, giving them a distinct brown tint. As in *C. sinica kittlitzi* the edges of the inner secondaries are grey. The main difference from *C. sinica* lies in the fact that the yellow wing-bar is further reduced to yellow outer webs towards the bases of the primaries only, with a white area towards edge of the inner web like that of *C. carduelis*.

The female of Oustalet's Black-headed Greenfinch, *C. ambigua*, of N.W. China is very like the female of *C. sinica kittlitzi* but a little darker above and yellower below. It is olive brown on the mantle and green on the rump, with grey upper tail-coverts. Below and on the throat it is greenish-yellow. There is a yellow wing-bar and grey edges to the secondary coverts. The head, with the exception of the throat, is dark grey. The male is generally greener, with a black head. The outer tail-feathers have the extensive yellow bases typical of this species group.

In the Black-headed or Himalayan Greenfinch, *C. spinoides*, the dorsal surface becomes darker and the ventral surface lighter. The female is very dark olive-brown on the mantle with an almost black crown and a yellow rump. Below and on the throat it is pale yellow. The male is blackish-brown on the mantle and crown, and deep yellow on the rump and under side. The edges of the inner secondaries are almost white. The wing-bar is yellow, and as in *C. spinus* is reinforced by yellow edges to the greater secondary coverts. The lesser and median coverts of the male are yellow, forming a conspicuous "shoulder" patch; but in the female only the median coverts are yellow, the lesser coverts being green. The outer tail feathers are yellow with dark tips and dark pigment along the rachis. The head pattern is very like that of *C. spinus* but with greater contrast. The crown, ear-coverts and a small patch on either side of the yellow throat are blackish-brown. The lores and supercilium are yellow, and a yellow border continuing around the dark ear-coverts isolates these from the

crown and throat patch. The posterior yellow border continues upwards to give a suggestion of a narrow yellow band at the hind edge of the nape, similar to the pale zone posterior to the dark cap of *C. spinus*.

A closely related species, *C. monguilloti*, of Annam has even more black in the plumage than the last. It is almost black dorsally with some faint evidence of masked yellow pigment on the mantle and a poorly defined yellow rump. Below it is yellow with short blackish streaks on the breast. There is a yellow wing-bar and yellow on the lesser wing-coverts of the male. Outer tail feathers are yellow with black on the tip and along the rachis. The throat is yellow but the remainder of the head is black, with a well-defined narrow yellow collar which almost meets at mid-nape.

These last three species show a divergent and more contrasting trend in plumage colouring but are clearly derived from the *C. sinica* type and show patterns suggestive of those found in *C. spinus*.

(d) *Generic characters*

From this review of plumage pattern in the genus *Carduelis* it is possible to determine that the characters most likely to occur in related species are—a wing-bar formed by light bases to the flight feathers; light patches on outer tail feathers; a green, yellow, or white contrasting rump and a tendency for distinct pale edges to the inner secondaries. Less constant characters are—light edges to greater secondary coverts; light coloured median and lesser secondary coverts forming a pale "shoulder" patch, and confined to the median coverts in the female; grey or black colour on crown and nape and yellow pigment in the plumage.

THE GENUS *Fringilla*

(a) *Chaffinch*

The body colouring of the female Chaffinch, *F. coelebs*, is very similar to that of the female of *C. chloris*, being olive brown above, paler below with a green rump. The presence of yellowish margins to the outer web of flight feathers on wings and tail increases this resemblance. The male in the breeding season bears a strong resemblance in dorsal colouring to the males of the Japanese races of *C. sinica*. The latter is ash-grey on crown and nape with blackish feathering on the forehead, warm brown with a chestnut tint on the mantle feathers, which are greener towards the base, yellowish-green on the rump and grey on the upper tail-coverts. The male of *F. coelebs* is blue-grey on crown and nape with a bold black forehead, chestnut-brown on mantle feathers which are green towards the base, green on the rump, and grey and green on the upper tail-coverts. The major difference is in the colouring of the underside, which in *F. coelebs* is chestnut-red, deeper on the sides of the head and upper breast but otherwise appearing as a pink tint on throat, belly and flanks. Reference has already been made to the presence of this chestnut-red pigment on the under side of *C. sinica*, where it is especially apparent on the females of the Japanese races. Conversely, males of *F. coelebs* have marked yellow pigment. Non-melanic variant individuals are white, and as might be expected, have yellow pigment on mantle, rump and the edges of flight feathers; but in addition areas of yellow pigment are also present on the sides of the head and on either side of the upper breast in those areas where the chestnut colouring of the normal bird has a warmer tint.

In *F. coelebs* the light edges of the inner secondaries are reduced to

narrow pale yellow margins. The wing-bar is white, and like that of *C. spinus* is absent from the first few primaries but otherwise complete. As in *C. spinus* and *C. spinoides* there are white tips to the greater secondary coverts forming a wing-bar. As in *C. spinoides* the median and lesser coverts of the male are light in colour, white in the present species, and form a conspicuous "shoulder" patch. The female of *F. coelebs* like the female of *C. spinoides* has the light patch restricted to the median coverts and the tips of a few adjacent lesser coverts.

The outer tail feathers of *F. coelebs* have a diagonal area of white extending to the tips on the inner webs, with black pigment towards the base of the feather and along the rachis, broadening towards the tip. The shape of the white area shows individual variation and would appear to be homologous with the white areas on the tail feathers of *C. carduelis* and the corresponding yellow patches on the tail feathers of other species (fig.).

F. coelebs has given rise to isolate populations in N.W. Africa and on the Atlantic islands, and these show the trend common in island forms for distinct specific signal markings to be lost in species isolated in areas where competitors are absent. In *F. c. spodiogenia* and *F. c. africana* the white "shoulder" patch is confined to the median coverts. In these races the blue-grey head colouring extends down over the ear-coverts with a similar distribution to that of the black on *F. montifringilla*. The black on the forehead extends to the lores in a manner similar to that of *C. sinica minor*. The mantle is green, like the rump. In the races of the Atlantic islands the green of the mantle is progressively lost and both back and flanks become blue-grey. On the Canary Islands an earlier invasion has given rise to a separate species, *F. teydea*. This is entirely blue-grey, with pale tips to the greater and median secondary coverts and tiny relict traces of white on the concealed bases of a few flight feathers.

(b) *Brambling*

The plumage colouring of the Brambling, *F. montifringilla*, would appear to bear the same relationship to that of *F. coelebs* as does that of *C. spinoides* and *C. monguilloti* to *C. sinica*. In both cases there is greater contrast and an extension of the amount of black plumage.

In *F. montifringilla* the male is black on head and mantle, but as in the *Carduelis* species quoted, the throat is pale. The size of the wing-bar is reduced, and the light areas on coverts and inner secondaries are tinted with chestnut-red. There are narrow yellow edges on the flight feathers. The rump is white, and white extends over belly and lower breast, while the upper breast and throat are light chestnut-red with a hint of the presence of yellow pigment. Yellow pigment is visible on the feathers of the carpal joint and on feathers bordering the upper breast and normally concealed by the wing when the bird is at rest. There is no white on the tail of the male but the female shows a faint diagonal streak on the outermost feather. The plumage of the female is similar to that of the male but brown fringes to the feathers give it a mottled appearance. The sides of the head are grey and the feather edges appear to conceal a dark cap extending down on to the nape on either side but with a whitish patch on mid-nape.

(c) *Discussion of relationship*

It is apparent that all the characters of plumage pattern and colour found typical of species of the genus *Carduelis* are also present as major plumage characters in the genus *Fringilla*. This suggests a close and direct

relationship between the two genera. In view of the relationship of *Fringilla* and the New World Emberizinae suggested by Tordoff (1954) it is necessary to consider briefly the plumage characters of the latter group. The plumage trends to be brown and heavily streaked, but this gives way to uniform colouring in some species. Species-specific markings are usually confined to the head and breast which are often boldly patterned. There are pale tips to the median and greater coverts in some species, but wing-bars formed by pale bases to flight feathers are absent. Rump colouring is not conspicuously different, and yellow pigment appears to be absent. There does not appear to be any reason to link *Fringilla* with this group on the basis of plumage characters.

The retention by *F. coelebs* of conspicuous plumage colouring in the mainland and its loss in isolate forms suggests that these colours have a valency as specific signals in regions where similar species are present. If this species had been derived from the American emberizids and had invaded the Palaearctic, it might be expected that it would retain characters which distinguished it from the cardueline finches and it would be extremely improbable that it would evolve a plumage extremely convergent with that of the genus *Carduelis*. Such a resemblance is, in this case, almost certainly evidence of close relationship, and from this evidence of plumage colour and pattern it is considered that the genus *Fringilla* is a part of the Old World finches of the family Fringillidae and that its plumage characters reveal a close affinity with the genus *Carduelis*.

Summary

Most related groups of species show common characters of plumage pattern and colour indicating their affinity. An examination of such characters in the genus *Carduelis* (including *Spinus*, *Chloris*, and *Hypacanthis*) and *Fringilla*, revealed that the typical characters of the first genus were also present in the second. *Fringilla* does not share the plumage pattern and colour characters of the New World Emberizinae, and it is considered that the present evidence helps to confirm the affinity of *Fringilla* with the Old World cardueline finches.

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A new race of *Lybius torquatus* from Tanzania

by J. G. Williams

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Among a small collection of birds collected at South Ulanga, Eastern Region, Tanzania, by Mr. Elias Numpungu of Tanzania National Parks, are two specimens of a very distinct, undescribed race of *Lybius torquatus*. which I name